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WASHINGTON, D.C. 20460

OFFICE OF
AIR AND RADIATION

Summary of Rationale for Version 2.0 ENERGY STAR® Residential Ventilating Fan Specification

I. Introduction and Background

This memorandum provides a summary of the rationale and key changes that appear in the Residential Ventilation Fan Version 2.0 specification. It contains the following information:

- Summary of the Version 2.0 Specification and the key changes from the last specification
- Summary of key milestones in the development of the Version 2.0 Specification
- Summary of comments provided by stakeholders
- EPA's rationale for deciding on key elements of the final Version 2.0 Specification

II. Summary of Version 2.0 Specification

EPA's goal in revising the Version 1.0 residential ventilation fan specification was three-fold: (1) to provide further clarification on existing technical and testing requirements, (2) to ensure higher product quality for qualifying fans; and (3) to increase the availability of ENERGY STAR qualified models in the marketplace. The following key changes were made to the specification:

- Inclusion of additional definitions to provide further clarification of terms and ensure specifications are consistent with industry standards.

- Adjustment of warranty requirement from 2 and 3 years (Tier I and Tier II) to 1 year.

- Movement towards efficient fluorescent lighting for ventilation fans with integrated light fixtures. Bathroom and utility room fans with incandescent fixtures or sockets accepting incandescent lamps are now excluded. Nightlights can continue to include incandescent lamps, not to exceed 4 Watts. Range hoods with incandescent light sources or sockets may qualify through December 31, 2004 but will need to meet fluorescent requirements starting January 1, 2005.

- Addition of new product categories, and associated performance requirements, for single and multi-port in-line ventilating fans, which were not previously covered by the Version 1.0 specification.

- Revision of the minimum Sone rating for range hoods to address sound performance under normal operating conditions (i.e. working speed) instead of high speed.

- Relaxation of the minimum Sone rating for large bathroom and utility room fans to balance sound requirements across the full range of fan sizes.

- Addition of an "installed fan performance" requirement to ensure quality performance when installed in the home. Installed fan performance requirements are specified as a minimum percent rated airflow at 0.25 in. w.g., which better emulates typical installed static pressure compared to the 0.1 in. w.g. rating condition.

- New requirements for inclusion of picture-type fan installation instructions and consumer recommendations regarding fluorescent light fixtures and electric resistance heating elements, if applicable.

- Addition of HVI certification requirement for ENERGY STAR qualification.

- Grandfathering is not allowed. Any model sold, marketed, or identified by the manufacturing partner as ENERGY STAR must meet the current specification in effect at that time. All products, including models originally qualified under Version 1.0 with a date of manufacture on or after October 1, 2003, must meet the new Version 2.0 requirements in order to use the ENERGY STAR on the product or in product literature.

- Text was added stating EPA's intentions to phase-out ventilating fans with electric resistance heating and range hoods with incandescent lighting, beginning January 1, 2005.

III. Key Milestones of Specification Revision

The final Version 2.0 specification was developed and finalized over the course of one year, which included the following key milestones:

- Several individual meetings and discussions with existing and potential ENERGY STAR ventilating fan partners and other industry stakeholders on Version 1.0 requirements, issues, and concerns.
- Three draft specifications released for stakeholder comment prior to finalization.

Throughout the product development process, all draft versions of the specification and stakeholder comments were posted to the ENERGY STAR Web site, with approval from the submitters.

IV. Summary of Stakeholder Input

In addition to feedback provided during partner and stakeholder discussions, EPA received written comments from existing and potential ENERGY STAR partners and other industry stakeholders. The key comments are summarized below, along with EPA's responses:

Warranty Period

- The 2- and 3-year warranty requirements were challenged based on the following claims: (1) for the last 25 years the industry standard has been 1-year; (2) longer warranties could be burdensome to the manufacturers and do not necessarily indicate a better product; and (3) a number of reliable, low cost fans representing a large portion of the marketplace exist that perform to ENERGY STAR levels but would not qualify based only on the higher warranty. Furthermore, industry questioned EPA's use of warranty to evaluate ENERGY STAR performance.

  EPA Response: In developing ENERGY STAR specifications, EPA strives to set performance levels that reward those products that yield energy savings without sacrificing performance. EPA addresses quality in a number of ENERGGY STAR specifications for this very reason. In developing Version 1.0 of the ventilation fan specification, EPA decided to use longer warranty periods as a surrogate for product quality, based on input from several manufacturers. However, in response to the concerns given above, EPA turned to industry for assistance in finding research or data that substantiate the need for longer warranties. EPA did not find nor receive any substantive proof that there is a link between longer warranties and increased product quality. As a result, EPA attempted to better define and address quality using other measurements. The new specification requirements for quality were vetted and refined through three drafts of the revised specification. EPA believes this new approach will achieve broader participation while still ensuring product quality.

- Written arguments for the opposing view (in support of longer warranty periods) were also provided to EPA by industry stakeholders. The common thread of these arguments was that manufacturers of high quality products should stand behind their products by warranting their performance for longer than the minimum industry standard. Furthermore, it was asserted that it is difficult to measure product quality in the absence of proprietary product failure and replacement rates, so a minimum warranty would be the next best thing. Several supporters of the longer warranty periods also pointed out that much effort and cost endured to extend the length of their product warranties in order to meet the requirements of the Version 1.0 specification. Reverting back to a 1-year warranty requirement was viewed by many as a step backwards.

  EPA Response: While EPA appreciates the arguments for longer minimum product warranties, it must also balance the goal of achieving high product quality with the equally important goal of reaching a significant portion of the market. ENERGY STAR product specifications are typically set such that the top 25% of energy-efficient performers in the current market would qualify. In the case of ventilating fans, models qualifying under Version 1.0 represented only a small part of the total market. EPA made some significant changes between the first draft and the final Version 2.0 specification is an attempt to encourage broader participation. Relaxing the warranty requirement to 1 year was one of these changes.

  However, EPA went to great lengths to ensure product quality would not be sacrificed as a result of this change by better defining product quality and the specifications necessary to meet it. Based on numerous discussions with HVI and several manufacturers, EPA identified three primary attributes that seemed to affect perceived and actual product quality for residential ventilating fans: early product failure, sound, and installed fan performance. By specifying minimum requirements in these three specific areas, EPA believes that actual and perceived product quality will be assured for residential ventilating fans that earn the

ENERGY STAR, without undue burden to participating manufacturers. EPA believes the standard 1-year warranty adequately addresses early product failure in the absence of more stringent industry standards. EPA included specific minimum performance requirements to address sound and installed performance.

Installed Fan Performance

- In draft 1 of the Version 2.0 specification, EPA addressed installed fan performance by requiring a minimum of 75% of rated airflow at 0.25 in. w.g., which best emulates typical installed static pressure compared to the 0.1 in. w.g. rating condition. There were some objections to this requirement because most qualifying smaller fans (i.e. 50, 60, and 70 CFM) would no longer qualify due to different pressure dynamics of small capacity fans. It was recommended to EPA to use 60% for smaller fans and 70% for larger fans to increase the number of qualifying fan models under this new requirement without sacrificing quality.

  EPA Response: EPA acknowledged these suggestions and requested data from HVI regarding the number of small fan models that would qualify under the suggested requirement. HVI provided this data, which was acceptable to EPA, and EPA adopted the 60% and 70% requirements for the Version 2.0 specification.

- EPA received a recommendation to use 50% for the small fan category, for rated airflow at 0.25 w.g. static pressure, based on the claim that the pressure requirement (even 60%) would be damaging to the ENERGY STAR program. This requirement would inadvertently encourage manufacturers to modify fan motors to "spin up" when duct pressure is unusually high, which would result in noisier and more unstable fans, contrary to EPA's intent.

  EPA Response: EPA discussed this issue further with HVI, and concluded that the "spin up" scenario was unlikely. EPA believes manufacturers will not deliberately modify their products in this way, risking poor performance. Furthermore, after careful review of the available data on small fan performance, EPA believes the 60% requirement will weed out the low quality small fans, while rewarding the higher quality, energy-efficient fans in that category.

Efficacy

- Industry raised a concern that overall the EPA specification was too stringent and contradictory to EPA's stated goal of targeting the top 25% of performers in the marketplace. Industry claimed that the Version 1.0 specification resulted in less than 3% market share, indicating that the efficacy levels were too high to achieve EPA's goals. It was then recommended that EPA relax the minimum efficacy levels for all fan categories to increase the market share of ENERGY STAR qualifying fans.

  EPA Response: In response to this concern EPA agreed to re-evaluate the efficacy levels established in the Version 1.0 specification for each product subcategory. However, EPA also had to weigh this request against other considerations such as perceived quality and integrity of the ENERGY STAR program. After reviewing manufacturer comments and performance data, EPA determined that by relaxing the warranty requirement and revising the sound requirements, additional models would have the opportunity to qualify as ENERGY STAR without lowering the energy efficiency requirements for any one subcategory. EPA believes that while the Version 2.0 specification may not initially achieve 25% market share, it surpasses that under the Version 1.0 specification and allows room for growth.

Sound Level Requirements

- EPA received a comment that sound level requirements had nothing to do with energy efficiency and would reduce the number of low cost energy-efficient fans that would otherwise qualify as ENERGY STAR thus limiting the overall energy savings that could be achieved through the program. Other industry members commented that the sound levels in Version 1.0 were not challenging enough.

  EPA Response: EPA acknowledged both sides and agreed to consider the impact of revisions to the sound level requirements on both product availability and perceived quality. After additional research and further discussions with industry, EPA decided to modestly relax the sound level requirements for larger fans, but leave the smaller fan category (10-80 CFM) requirement at 2.0 Sones. EPA expects that taking this approach will increase product availability in those subcategories with the lowest penetration to date, without compromising the quality associated with the ENERGY STAR mark.

Eligibility of In-Line Fans

- Panasonic and HVI argued for the inclusion of in-line fans, as they are more efficient than typical spot ventilation fans, and are used more frequently in continuous duty applications, where energy savings potential are much greater.

  EPA Response: EPA agrees with these points and after reviewing available single-port fan performance data decided to include in-line ventilating fans in the Version 2.0 specification. Although these products are not rated for sound, manufacturers of these products are required to include additional installation instructions to ensure optimum performance and quiet operation. These requirements are presented in Sections 3.C and 4.D of the specification. Although EPA has not reviewed specific performance data for multi-port in-line fans, these products are included due to their known similarity to single-port in-line fans regarding efficiency and application. Furthermore, the additional energy efficiency benefits derived from multi-port fan installation in the home are significant (i.e., one fan performing the job that would otherwise have required multiple fans).

Eligibility of Heat Recovery Ventilators

- EPA received some suggestions to include Heat Recovery Ventilators (HRV's) because they: (1) are more efficient than typical spot ventilation fans; (2) are used more frequently in continuous duty applications where energy savings potential are much greater; and (3) result in additional energy savings due to heat recovery.

  EPA Response: While EPA agreed with these points, HRV's do have unique characteristics that require further investigation to ensure the EPA specification is effective at encouraging the sales of more efficient HRV's. Further research is required to achieve this objective and EPA did not wish to hold up other important Version 2.0 specification revisions to conduct this research. EPA continues to be interested in this product type and based on manufacturer interest and available data will consider including it in the future.

Elimination of Incandescent Lighting

- Manufacturers of range hoods provided several comments regarding the proposed elimination of incandescent lighting in range hoods in Draft 1 of the Version 2.0 specification. One manufacturer insisted that this restriction would eliminate most range hoods from qualifying, since the majority of range hoods on the market include incandescent

lighting. Furthermore, there was some concern about mercury contamination from potential fluorescent lamp breakage. Other manufacturers asked for more time to develop range hood products that could comply with this requirement.

EPA Response: EPA's intention of excluding models that could accept incandescent lamps for general lighting under this Version 2.0 specification is to ensure the long-term energy savings associated with using compact fluorescent and other energy-efficient light sources. This requirement would ensure that a consumer could not replace the original energy-efficient lamp with a less efficient incandescent lamp, thus guaranteeing long-term savings. However, EPA decided to allow incandescent range hood models to continue to qualify as ENERGY STAR through December 31, 2004 so that EPA and manufacturers could work through these issues. Some ENERGY STAR partners are already qualifying ventilating fan models with fluorescent lighting, further supporting the movement toward, and interest in, energy-efficient light sources. It is EPA's hope that range hoods will follow. Therefore, as of January 1, 2005 range hoods will be required to comply with the lighting requirements presented in the Version 2.0 specification. In the short term, EPA is addressing energy consumption of these product types by: (1) limiting the total lamp wattage to 50 watts, similar to the fluorescent lighting requirements for bath and utility fans; and (2) requiring a consumer recommendation on product packaging to use fluorescent lamps.

Elimination of Electric Resistance Heating

- There was some concern that exclusion of ventilating fan models with electric resistance heating would eliminate fan models specifically designed to meet Version 1.0 requirements, without allowing manufacturers of these products sufficient time to develop alternative heating technologies. The heating function included in these products is supplementary to the primary purpose of ventilating fan, which is to remove air. It was recommended that EPA require a statement on the product packaging to clarify that the heating element was not considered in ENERGY STAR qualification. EPA also received requested to allow manufacturers a transition period to develop new technologies and make design changes.

EPA Response: In draft 2 of the Version 2.0 specification, EPA proposed to exclude ventilating fan models that incorporate electric resistance heating elements. It continues to be EPA's intention to exclude electric resistance heating technologies to encourage the development of more energy-efficient technologies. Electric resistance heating is not as efficient as typical central heating systems and inclusion of electric resistance heating elements in ENERGY STAR qualified fans may lead to consumer confusion. However, EPA also recognizes that for those ventilating fan models that currently qualify as ENERGY STAR under Version 1.0, additional time will be needed to research new technologies and redesign products. Therefore, EPA decided to allow qualifying ventilating fan models with electric resistance heating elements to continue to qualify through December 31, 2004. To minimize potential confusion about the efficiency of electric resistance heating in qualifying fans with heating elements, EPA added a requirement to the Version 2.0 specification that manufacturers clarify that the heat source is not ENERGY STAR qualified (see Section 3.C of the specification for packaging instructions).

Sound Rating of Range Hoods

- Several manufacturers commented that their range hood products could not meet the Version 1.0 specification sound level requirements at high speed. They claimed that maximum speed is designed to exhaust large amounts of smoke and fumes quickly and not intended for

frequent use. Instead, industry recommended the sound rating requirement be measured at "working speed", as defined by HVI.

EPA Response: After discussing this issue with HVI, EPA agreed to change the sound rating requirement for range hoods in Draft 2 of the Version 2.0 specification. To be consistent with bathroom and utility fan sound level requirements in Table 3, which are tested at similar airflows, EPA decided to establish a lower maximum sound level requirement for range hoods, specifically from 3.0 to 2.0 Sones. EPA believes that the sound requirements included in the Version 2.0 specification continues to represent the top performers in the marketplace. It continues to be EPA's hope that this specification will encourage manufacturers to produce more models that meet both efficacy and sound requirements resulting in more choices of ENERGY STAR qualified models in the marketplace.

- One manufacturer was concerned with this new testing requirement and claimed that using working speed to measure range hood performance would be confusing to consumers and that it is not a true indicator of product performance.

EPA Response: EPA clarified that the working speed test results are for qualification purposes only. Partners would not be required to market this information to the consumer. Furthermore, based on discussions with HVI, EPA continues to believe that working speed is the better indicator based on the following two reasons: (1) range hoods are currently tested at HVI at low speed (typically 100 CFM), based on the ASHRAE ventilation standard for range hoods (Standard 62-1982); and (2) consumer surveys by manufacturers over the last 10+ years indicate that range hoods are most often used at lower speeds.

HVI Certification

- EPA received several comments from manufacturers suggesting that ENERGY STAR qualified ventilation fans should be required to have HVI certification, in accordance with HVI Standard 920, to ensure a level playing field.

EPA Response: EPA agreed with this point, and decided to include this requirement, to ensure third-party verification and accurate reporting of product performance. It is EPA's understanding that while testing must be done in an HVI certified laboratory, manufacturers do not have to be HVI members to participate in the certification program.

V. EPA Rationale for Specification

EPA uses a consistent set of criteria in the development and revision of specifications for ENERGY STAR qualified products. These criteria guide EPA in its decision making and help EPA ensure that the ENERGY STAR will continue to be a trustworthy symbol for consumers to rely upon as they purchase products for the home or business and so that their purchases will deliver substantial environmental protection. These criteria include:

- Significant energy savings and environmental protection potential on a national basis;
- Product performance is maintained or enhanced;
- Qualified products will be cost-effective to the buyer and manufacturer;
- Efficiency can be achieved with several technology options, at least one of which is non-proprietary (i.e., not exclusive to proprietary technology);
- Product differentiation and testing are feasible; and

— Labeling would be effective and recognizable in the market.

Below EPA addresses the Version 2.0 Specification relative to each of these criteria.

— *Expected Energy Savings and Environmental Benefits.* Eliminating the incandescent lighting options in ventilating fans and range hoods (beginning January 1, 2005) and allowing only pin-based CFL lighting will ensure the long term energy savings and environmental benefits promised by fluorescent lighting. Furthermore, by substituting other performance metrics for the longer warranty requirement and adjusting the sound requirements to be more representative of quality products in the marketplace EPA expects an increase in product availability under the Version 2.0 specification.

— *Product Performance is Maintained or Enhanced.* EPA believes that the minimum requirements provided in the Version 2.0 specification maintain or enhance product performance. EPA attempted to balance the warranty relaxation decision by holding fast to the efficacy requirements, despite manufacturer pressure to lower efficacy requirements, and by including other measures of quality in the specification. The additional product quality requirements include: (1) requiring HVI certification; (2) requiring that fans be tested at a static pressure similar to conditions expected when installed (0.25 static pressure) and that they produce airflow no less than 60-70% of rated airflow at the rated conditions of 0.1 in. w.g. static pressure; and (3) including installation instructions and consumer recommendations to encourage product installation that ensures product performance. Other performance requirements went unchanged, with two exceptions. Sound requirements were relaxed slightly for smaller fans and range hoods, which must now be tested at working speed[1]. Although the warranty is relaxed, the performance and quality requirements presented in this specification should ensure that only high quality products qualify and bear the ENERGY STAR.

— *Cost-effectiveness.* Cost differentials between ENERGY STAR and standard models are a result of many different design characteristics, only some of which are related to energy efficiency. Construction material and control features can also affect price. While consumers may pay more upfront for ENERGY STAR qualified ventilating fans, in most cases the savings achieved would cover this initial cost within the first few years of use. EPA also believes that manufactures will be able to meet the revised ENERGY STAR requirements with little or no redesign of existing products.

— *Several Technology Options, including some with Non-proprietary Technology.* EPA believes that several options continue to exist for improving the energy performance of residential ventilating fans and range hoods. These options include:

- Availability of energy-efficient lamps and ballasts already being used by other ENERGY STAR lighting products in the marketplace;

[1] Working speed is the lowest speed above 100 CFM (two-speed fans) and 90 CFM (multi-speed fans); it is widely accepted that this is the more common operating condition for range hoods. Consequently, the change from 4.0 Sones at high speed to 2.0 Sones at working speed is actually a relaxation of the sound requirement, which previously eliminated virtually all range hoods.

- Ability of both standard ceiling mounted ventilating fans and remote-mounted in-line fans to qualify as ENERGY STAR, providing a number of different product-line options to the manufacturer.

- Non-prescriptive sound and efficiency requirements that allow manufacturers to develop a combination of technologies to meet both.

— *Product Differentiation and Testing Procedure.* As was the case when EPA initially established ENERGY STAR efficiency criteria for residential ventilating fans, product performance varies within a sufficient range to allow for meaningful differentiation to the consumer. Furthermore, as a result of the revisions made to the specification, a number of new and existing products can now qualify as ENERGY STAR further differentiating the marketplace.

  Version 2.0 now requires certification of qualified products by HVI, the accepted certification body for the ventilating fan industry. The HVI certification procedures for measuring and reporting ventilating fan performance continue to be effective and the HVI testing laboratory has proven to have sufficient capacity to serve the certification needs of the industry. Furthermore, by requiring HVI certification EPA ensures accurateness of the reported performance data.

— *Labeling*. EPA believes the ENERGY STAR mark serves an important role in the marketplace. It provides an objective basis for buyers to identify, and manufacturers to promote, highly efficient ventilating fans and range hoods. Examples of the impact made to date by ENERGY STAR qualified ventilating fans and range hoods are provided below:

- There are currently eight partners offering more then 80 ventilating fan models, 20 of which represent the new in-line fan product category;

- These fans are sold in many different distribution channels, including showrooms, mass retailers, and new construction accounts, all of which include champion ENERGY STAR partners searching for ways to differentiate themselves and their product offerings in the market; and

- EPA is receiving interest in ENERGY STAR qualified ventilating fans and range hoods from the new construction market and regional utilities looking to provide rebates and incentives for ENERGY STAR qualified products.

VI. Noteworthy Aspects of the Specification

— Revision of Warranty Period Back to 1 Year: EPA changed the minimum warranty requirement from 2 and 3 years to 1 year. This change was made primarily to increase the selection of ENERGY STAR qualified ventilating fans. EPA took considerable steps to ensure this change did not result in a sacrifice in performance.

— Addition of Installed Fan Performance Requirements: In order to ensure product quality, EPA added a requirement to ensure that fans qualifying and performing well under laboratory conditions also meet the expectation of the consumer after actual installation.

- Addition of In-Line Fan Product Category: As a result of manufacturer interest and energy savings potential of this product category, EPA added single-port and multi-port in-line fans and associated performance requirements to the program.

- Revision of Sound Rating Requirements: The sound rating requirement was relaxed for large residential ventilating fans to make the sound rating requirements more consistent across the four product size categories.

- Phase Out of Electric Resistance Heating and Incandescent Lighting: EPA's decision to continue allowing screw-based sockets and electric resistance heating elements in ENERGY STAR qualifying ventilating fans through December 31, 2004 was to give partners time to develop more efficient heating and lighting technologies. As of January 1, 2005 range hoods with incandescent light sources and fans with electric resistance heating will not be allowed to qualify as ENERGY STAR.

- Requirement for HVI Product Certification: All qualifying ventilating fans are required to be certified through HVI's certification standards.